Remarks

Claims 1-33 remain in the application. In the Office Action, claims 1 and 13 were rejected on the basis of 35 USC 102(b), as follows:

> Claims 1 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Waldron et al. (USPN 6168067 B1).

According to the U.S. Patent Office,

> Waldron teaches a method of welding Al alloy by aging before and after welding (col 3 line 36 - col 4 line 5 and col 5 lines 22-36) to a predetermined temperature for a predetermined time to induce precipitation hardening (col 6 lines 12-24), particularly to temperatures between 100 C and 300 C for a period of hours (col 6 line 61 - col 7 line 40).

The rejection is respectfully traversed.

Applicant's invention includes the steps of aging, welding, and aging again. Applicant's claim 1 is set forth below for convenience.

> 1. A method of welding age-hardenable aluminum alloy to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:
>
> (a) providing precipitation hardenable aluminum alloy members to be welded;
>
> (b) subjecting said members to a first aging step for times and temperatures to generate strengthening precipitates to provide aged members;
>
> (c) welding said aged members to provide a welded assembly having a weld zone; and
>
> (d) subjecting said welded assembly to a second aging step to reprecipitate strengthening precipitates dissolved in the weld zone during the welding step.

The Office Action states that Waldron teaches a method of welding aluminum alloys by aging before and after welding, and cites col. 3, line 36, to col. 4, line 5, and col. 5, lines 22-36.

Col. 3, line 36, to col. 4, line 5, is as follows:

> In order to improve the mechanical properties of the structural member 22, including the strength, hardness, and corrosion resistance of the

member, the member is preferably precipitation hardened. Precipitation hardening of metal alloys is a process whereby the mechanical properties of the metal alloy are improved by the formation of uniformly dispersed particles or precipitates of one or more secondary phases within the original phase matrix. Precipitation hardening requires that the metal alloy undergo two heat treatment processes, the first process being a solution heat treatment and the second process being a precipitation heat treatment.

Referring to FIG. 2B, there is shown a hypothetical phase diagram for a precipitation-hardenable metal alloy composed of alloying elements A and B. Although FIG. 2B illustrates a phase diagram for a binary system, precipitation-hardenable metal alloys may contain two or more alloying elements. For a metal alloy to be precipitation hardenable, the alloy must have an appreciable maximum solubility of one element in the other, on the order of several percent; and a solubility limit that rapidly decreases in concentration of the major element with temperature reduction. Both of these requirements are satisfied by the hypothetical phase diagram of FIG. 2B, where the maximum solubility is designated by M. Additionally, the composition of a precipitation-hardenable metal alloy must be less than the maximum solubility M. Examples of some of the binary and ternary metal alloys that are precipitation hardenable include aluminum-calcium, aluminum-chromium, aluminum-cobalt, aluminum-copper, aluminum-iron-titanium, aluminum-gallium-germanium, aluminum-gallium-indium, aluminum-germaniumtin, aluminum-lithium, aluminum-lithium-magnesium, aluminum-manganese, aluminum-molybdenum, aluminum-nickel-titanium, aluminum-niobium, aluminum-silicon, copper-beryllium, copper-tin, magnesium-aluminum, as well as some ferrous alloys.

It is respectfully noted that col. 3, line 36 through col. 4, line 5, does not teach aging ***before welding***. Instead, this merely refers to the prior practice of aging. Nowhere in this quotation is there any reference to ***welding***. It should be noted that "22" only refers to a structural member formed of a precipitation-hardenable alloy having two more ***alloying*** elements. Thus, for a first reason, claims 1 and 13 cannot be rejected under 35 U.S.C. §102(b), and thus for this first reason, Applicant's invention is patentable over Waldron.

For a rejection under §102, the reference must show all the features or elements of the claim within its four corners. For an invention to be anticipated under 35

U.S.C. §102(b), the reference must teach every aspect of the invention. This rule is set forth in the MPEP, §706.02, as follows:

> . . . for anticipation under 35 USC 102, the reference must teach every aspect of the invention . . .

This rule has been adopted by the courts. For example, the District Court, D. Delaware, *Studiengesellschaft Kohle mbH v. Dart Industries, Inc.* 216 USPQ 384, stated the Third Circuit test for anticipation, which is as follows:

> For a prior publication to defeat a patent it must exhibit a substantial representation of the invention in such full, clear and exact terms that one skilled in the art may make, construct and practice the invention without having to depend on either the patent or on his own inventive skills.

For a §102 rejection, *In re Marshall* 198 USPQ 346 sets forth the standard, as follows:

> Rejections under 35 USC 102 are proper only when the claimed subject matter is identically disclosed or described in the prior art.

Clearly, the Waldron citation is not identical to Applicant's invention.

The number 22 is only referred to in Fig. 2A of Waldron. Fig. 2A of Waldron indicates in the "Brief Description of the Drawings" that "Fig. 2A is a perspective view showing a structural member of preselected dimensions fabricated from a precipitation-hardenable metal alloy, as is known in the art. Again, there is no reference to welding. Thus, it is respectfully submitted that claims 1 and 13 are not anticipated by or made obvious by Waldron, and thus are patentable over Waldron.

The Office Action then cites Waldron, col. 6, lines 12-24, and col. 6, line 61 to col. 7, line 40, for precipitation hardening, which are as follows:

> Once all the structural members of the structural assembly are ***joined***, the precipitation hardening of the component structural members of the assembly may be completed by ***naturally*** or ***artificially aging*** the assembly to the desired temper at a predetermined temperature schedule. Referring again to FIGS. 2B and 2C, artificial aging or precipitation heat treatment requires that the structural assembly undergo an isothermal heat treatment whereby the temperature of the assembly is raised to a

predetermined temperature, designated by T_2, for a predetermined amount of time, designated t_2. The temperature T_2 is within the α and β two-phase region of the hypothetical phase diagram and is a temperature at which the diffusion rates for the B atoms become appreciable. (Emphasis added.)

It is respectfully submitted that columns 6 and 7 do not refer back to Fig. 2A, but instead to Figs. 3 and 4. Waldron teaches, referring to Figs. 3 and 4, at col. 4, lines 49 to 52, as follows:

> As illustrated in FIGS. 3 and 4, the structural members 24, 26, both of which have been ***solution heat treated***, but have an incomplete temper, are preferably joined by friction stir welding to form a structural assembly. (Emphasis added.)

Again, it will be noted that there is no reference to aging before welding but merely to solution heat treating.

It must be noted that Applicant's claim 1 requires the step of aging as follows:

> (b) subjecting said members to a first aging step for times and temperatures to generate strengthening precipitates to provide aged members;

Further, it should be noted that Waldron is ***silent*** in these citations with respect to aging prior to welding, but instead teaches only solutionizing or solution heat treatment prior to welding. These are two different concepts, as will be seen by the properties for an age-hardenable alloys shown in "Elements of Materials Science", by Lawrence H. VanVlack, Addison-Wesley Publishing Company, Inc., 1959, 1964, pp. 312 and 315, reproduced below, as follows:

Table 11-2

Properties of an Age-Hardenable Alloy (95.5% Al-4.5% Cu)

	Treatment (See Fig. 11-27)	Tensile Strength, Psi	Yield Strength, Psi	Ductility, % in 2 in.
A	Solution-treated and quenched	35,000	15,000	40
B	Age-hardened	60,000	45,000	20
C	Overaged	~25,000	~10,000	~20
D	Annealed	25,000	10,000	15

It should be noted that there is a dramatic difference in strength between solution heat treated and age-hardened.

This is also illustrated by table 11-3, page 315, as shown below:

Table 11-3

Tensile Strengths of a Strain- and Age-Hardened Alloy (98% Cu-2% Be)

Annealed (1600°F)	35,000 psi
Solution-treated (1600°F) and cooled fast	72,000
Age-hardened only	175,000
Cold-worked only (37%)	107,000
Age-hardened, then cold-worked	200,000 (cracked)
Cold-worked, then age-hardened	195,000

It will be seen that solution heat treat which occurs at 1600°F produces a strength of 72000 psi, and the aging step which occurs at much lower temperature produces a strength of 175,000 psi. Thus, these are entirely different concepts, and the Waldron citation only teaches solution heat treatment prior to welding. Accordingly, Applicant's invention is patentable over Waldron.

Waldron teaches a different invention for another reason. That is, Waldron summarizes his invention at col. 7, lines 6-40, as follows:

Referring now to FIG. 5, there is illustrated the operations performed to manufacture a structural assembly according to one embodiment of the present invention. The first step includes ***solution heat treating*** a structural member to dissolve all solute atoms so as to form a single-phase solid solution. See block 60. The ***second step involves quenching*** the structural member to a predetermined temperature to prevent diffusion and the accompanying formation of any of the solute phase. See block 62. The first and second steps may then be repeated as necessary to solution heat treat the structural members of the resulting structural assembly. (Emphasis added.)

The friction stir welding probe is then moved through the structural members along the path created by the interface of the members to thereby form a continuous weld joint along the length of the structural members. See block 68. Concurrently with the moving step, the structural members are quenched proximate to the weld zone to reduce the size of the heat-affected region. See block 70. The inserting, moving, and quenching steps may then be repeated as necessary to join any remaining structural members of the resulting unitary-structural assembly.

The structural assembly is then ***aged or precipitation heat treated*** at a predetermined temperature over a predetermined time period to obtain the desired character of solute particles. See block 72. Thereafter, the structural assembly is cooled to room temperature. See block 74. The structural assembly may then be secured to other assemblies, such as adjacent wing or fuselage panels, to form the frame of an aircraft. See block 76. (Emphasis added.)

Clearly, it will be seen that Waldron teaches solution heat treatment prior to welding. Thus, Applicant's invention is patentable over Waldron.

In the Office Action, claims 1-16, 19, 22-28, 30 and 31 were rejected as follows:

Claims 1-16, 19, 22-28, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedictus et al. (US 2005/0006010 A1).

Benedictus teaches a method of forming members of an Al alloy of series 7xxx particularly 7050, by aging before and after welding to temperatures between 105 C (221 F).and 170 C (338 F) for 6 to 24 hours (abstract and paragraphs 1-3, 9, 37, 38)using known tempering schedules which include but are not limited to T6, T76, T73 and T74). Although it is

taught that the members have good weldability (abstract, paragraph 35), there is no positive welding step.

It would have been obvious to one of ordinary skill in the art at the time of the invention to weld the members to form the aircraft or vehicular members (paragraph 2).

It is respectfully submitted that claims 1-16, 19, 22-28, 30 and 31 are patentable over Benedictus.

Benedictus is concerned with a method for producing high strength Al-Zn-Cu-Mg alloys with improved fatigue crack growth resistance and a high damage tolerance. The Abstract notes that the invention concerns a weldable plate product of such strength Al-Zn-Cu-Mg . . . . However, Benedictus is ***silent*** with respect to aging ***before and after welding***, as asserted by the U.S. Patent Office. The only mention of welding in the Abstract is as follows: "The invention concerns a weldable plate product with such high strength . . ." Paragraphs 1-3, 9, 37 and 38 cited by the Patent Office are ***silent*** with respect to welding. Paragraph 35 refers to welding, but merely indicates that there are problems with the weldability of the alloy product.

In the Office Action, claims 2-12 and 14-33 were rejected as follows:

Claims 2-12 and 14-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waldron et al. (USPN 6168067 B1) in view of Park (USPN 4589932).

Waldron teaches a method of welding At alloy by aging before and after welding (cot 3 tine 36 - col 4 line 5 and cot 5 lines 22-36) to a predetermined temperature for a predetermined time to induce precipitation hardening (col 6 lines 12-24), particularly to temperatures between 100 C and 300 C for a period of hours (cot 6 line 61 - col 7 line 40). However the time and tempering schedules are not further disclosed. Neither are the alloys further disclosed.

Park teaches aging of Al alloys in series 2xxx, 6xxx and 7xxx such as 2024, 7475, 6061 (col 9 liens 30-34) using known tempering schedules which include but are not limited to T5 and T6 which take place at typical temperatures of 220 F to 350 G for a typical period of hours (figures 2, 3,

col 1 lines 25-61, col 6 lines 56-67, col 13 line 45 - col 14 line 9 and Table VII). The members are welded (col 14 lines 63-68).

It would have been obvious to one of ordinary skill in the art at the time of the-invention to use known tempering schedules to maintain the desired strength, stiffness and ductility in both the weld zone and the heat-affected region in a simple and predictable manner. Al alloys in the 2xxx, 6xxx and 7xxx series are well known, cost- effective aircraft alloys.

It is respectfully submitted that claims 2-12 and 14-33 are patentable over Waldron taken in view of Park. As noted earlier, col. 3, line 36 through col. 4, line 5 does not teach aging before welding. Instead, this is a reference to the prior practice of aging. Nowhere in this quotation is there any reference to welding. As noted earlier, the number 22 only refers to a structural member formed from a precipitation hardenable alloy having two or more alloying elements. Further, Waldron indicated under "Brief Description of the Drawings" that "FIG. 2A is a perspective view showing a structural member of preselected dimensions fabricated from a precipitation-hardenable metal alloy, as is known in the art." Again, there is no reference to welding.

With respect to Park, the only reference to welding is col. 14, lines 63-66, where it is indicated as follows:

The improved products provide for many improved structural members including shipping pallets and containers made by shaping sheet or extrusion members and riveting or welding the assemblies together.

Clearly, this is not a teaching of Applicant's invention. That is, Park does not supply the steps missing in Waldron. It is respectfully submitted that Applicant's claims are patentable over the combination of Waldron and Park. It is further submitted that Applicant's invention is patentable over the combination of Waldron and Park for a further reason. That is, there is no suggestion to make the combination rejection.

The Court of Appeals for the Federal Circuit (CAFC) has continued to maintain the requirement of its predecessor court, the CCPA, that there be a ***suggestion of desirability*** of combinations and/or ***modifications in references*** being cited. In

C. Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick, 221 USPQ 481 (Fed. Cir., 1984), at page 488, the Court stated:

> The claimed invention must be considered as a ***whole***, and the question is whether there is something in the ***prior art as a whole*** to suggest the desirability, and thus the obviousness, of making the combination.
>
> Nothing in the references ***alone or together*** suggests the claimed invention as a solution to the problem of crushing rigidly massive scrap. (Emphasis added.)

The Court then cited, with approval, In re Imperato, 179 USPQ 730, and In re Sernaker, 217 USPQ 1.

The CCPA and more recently the CAFC have recited the requirement of a suggestion for combining references in a number of cases. In the case of In re Imperato, the CCPA stated, at page 732:

> With regard to the principle rejection, we agree that combining the teaching of Schaefer with that of Johnson or Amberg would give the beneficial result observed by appellant. However, the mere fact that these disclosures ***can*** be combined does not make the combination obvious unless the art also contains something to suggest the desirability of the combination. (Emphasis in original.)

In Applicants' case, the main reference, Waldron, is concerned with welding solution heat treated material, and Applicant's invention is not concerned with welding solution heat treated material. The In re Imperato case was cited with approval by the District of Columbia District Court in Berghauser v. Dann, Commissioner of Patents, 204 USPQ 393 at page 396.

The CAFC, in ACS Hospital Systems, Inc. v. Montefiore Hospital, 221 USPQ 929 stated, at page 933:

> Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, ***absent some teaching or suggestion supporting the combination***. Under section 103, teachings of references can be combined ***only*** if there is some ***suggestion or incentive*** to

do so. The prior art of record fails to provide any such suggestion or incentive. (Emphasis in original)

It is respectfully submitted that instead of supporting a suggestion, these two references are concerned with welding different materials. Thus, there can be no suggestion. Thus, for this additional reason, Applicant's invention is patentable over this combination.

In view of the above remarks, it will be noted that a sincere attempt has been made to place this application in condition for allowance. Therefore, reexamination and reconsideration are requested and allowance solicited at an early date.

Respectfully submitted,

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